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1. BACKGROUND

The purpose of this Biological Assessment is to meet requirements of the United States Army Corps of Engineers (USACE) under the federal Endangered Species Act (ESA) with respect to operation of the Willamette Project. The USACE constructed and operates the Willamette Project. For the purpose of this Biological Assessment, the "Willamette Project" is defined as the system of 13 dams and reservoirs and associated bank protection projects within the Willamette River basin of northwestern Oregon (Figure 1-1) from the upper-most end of each reservoir downstream to the Willamette Falls at Oregon City, Oregon. Section 2 describes the Willamette Project in detail.

Other federal and state agencies and programs affect environmental conditions and species listed under the federal ESA that are located above the Willamette Project reservoirs. The USACE assumes that federal ESA compliance with respect to these areas and programs will be handled by the appropriate action agencies for those areas and programs.

1.1 WILLAMETTE PROJECT AUTHORIZATIONS

In House Document (HD) 531, Congress authorized the USACE to construct and operate the system of Willamette River basin reservoirs as a true multiple purpose project. Congress provided relatively few specific operating criteria. As a consequence, the USACE attempts to balance operations of the system for all authorized purposes, including flood control, irrigation, navigation, and flow augmentation for water quality, fish, wildlife, and recreation.

To measure the current authorizations for a given project feature within the Willamette Project, it is necessary to examine prior statutes as well as the most recent authorization. Currently there are over 130 statutes pertaining to authorization of the Willamette Project. The three major authorizations at issue are:

(a) **The Flood Control Act of June 28, 1938** [52 Stat 1215] authorized the flood control project for the Willamette River and Tributaries, Oregon, as described in HD 544, 75th Congress, 3rd Session. The project authorized included seven reservoirs as listed below with 1,345,000 acre-feet of usable flood-control storage.

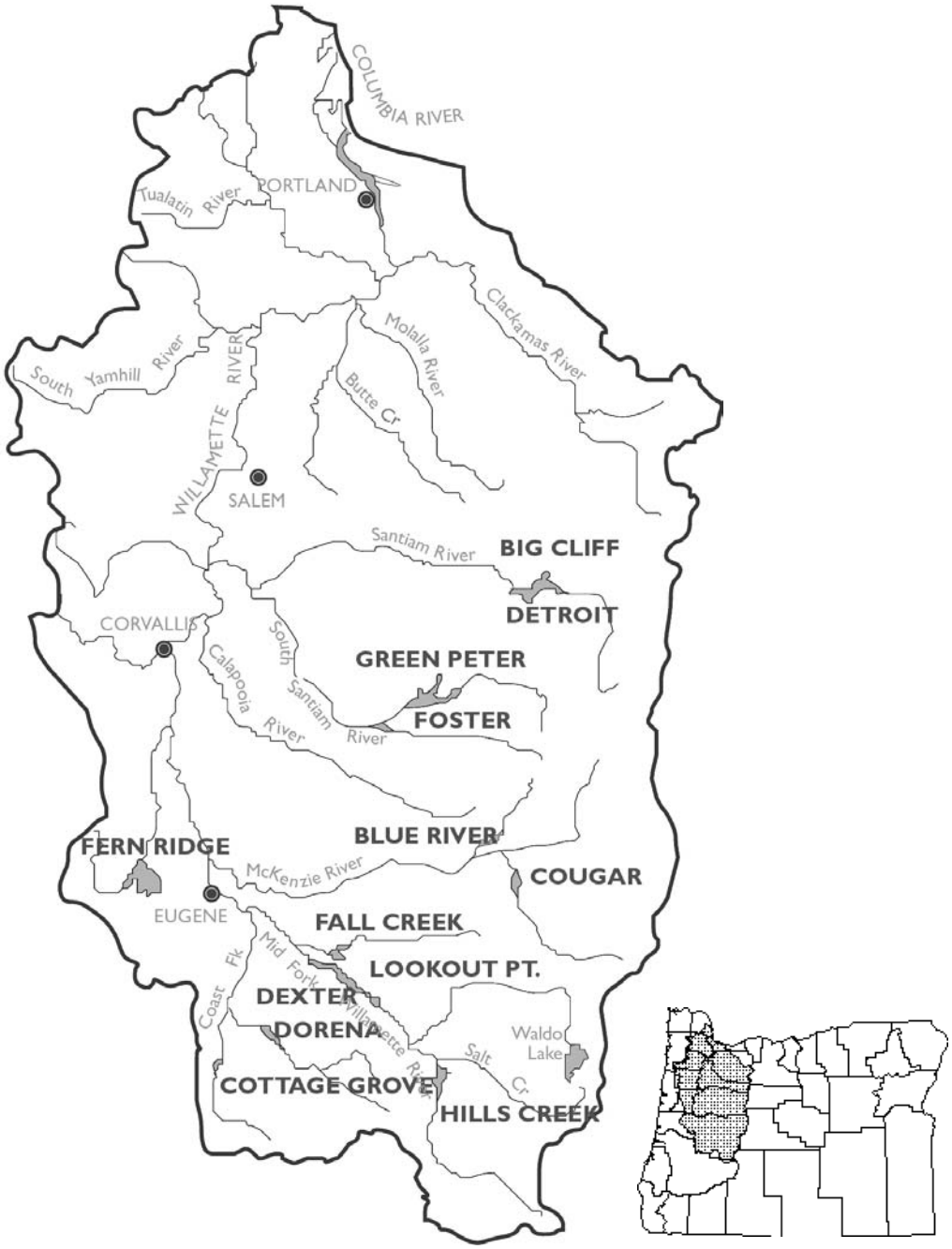

Figure 1-1. Map of the Willamette River basin showing major tributaries and the locations of the thirteen USACE flood control projects.

(1) Lookout Point;
(2) Dexter;
(3) Cottage Grove;
(4) Dorena;
(5) Fern Ridge;
(6) Detroit; and
(7) Big Cliff.

(b) Following World War II and the flood disasters of May-June 1948, Congress adopted the eight-volume Columbia River basin-wide flood control and multi-purpose water development and management plan, HD 531, in **the Flood Control Act of May 17, 1950** - about 6 weeks before the start of the Korean War. Five more Willamette projects were added by HD 531:

(1) Hills Creek;
(2) Fall Creek;
(3) Cougar;
(4) Blue River; and
(5) Green Peter.

(c) **The Flood Control Act of 1960** adopted Senate Report 104 which provided for a reregulation dam for Green Peter, designated Foster Dam. This was the last of the 13 dams actually built as part of the overall Willamette Project.

(d) Authorized dams that were subsequently deauthorized included Holley, Gate Creek, Strube, and Cascadia dams.

1.1.1 The Flood Control Act of 1950 and House Document 531

The Flood Control Act of May 17, 1950 provided the most recent comprehensive reauthorization of the Willamette Project. In that act, Congress authorized the USACE to construct the Willamette Project as described in HD 531, an 8-volume authorization of the Federal Columbia River Flood Control System that encompassed the entire Columbia River basin within the boundary of the United States, including the Willamette River basin.

Volume 1 of HD 531 contains the basic summary report of the USACE Division Engineer. The

other seven volumes contain various appendices and supplementary data, much of it on a subbasin by subbasin basis. Volume 5 is devoted entirely to the Willamette River basin. The following key elements are extracted from HD 531.

1.1.1.1 Volume 1, The Willamette River Subbasin Discussion

Table IV-51 at page 236 summarized the status of prior projects on the Willamette River basin in 1949. Fern Ridge and Cottage Grove dams were completed, as was the existing navigation channel from Portland to the Pacific Ocean. Willamette Falls Lock provided shallower navigation capabilities upstream on the Willamette River. Dorena, Detroit, and Meridian (Lookout Point) dams were under construction, and previously authorized Quartz Creek (McKenzie River) and Sweet Home dams were recommended for abandonment and substitution by other sites.

At pages 236-240, the needs of navigation, flood control, power, irrigation, recreation, fish and wildlife, pollution control, and domestic water supply were discussed. The section on domestic water supply stated:

> "Nearly all communities within the subbasin are experiencing a rapid growth. . . . These suburban developments require water for domestic use and for irrigation of family gardens. The community water departments are being asked to supply this water. To solve these problems, those towns west of the Willamette River either will have to store surplus winter run-off for summer use, or take water from the Willamette River or one of its tributaries. East-side communities might be able to meet demands by expanding present facilities. The total quantity of water required for domestic use will be small in comparison with the total storage capacity of reservoirs required for flood control and multiple-purpose uses. Ample storage in individual reservoirs will be available at relatively low cost for domestic use when current facilities can no longer meet the demands."

The authorized plan of improvement at pages 242-243 included new dams and improvements to existing dams (including power), construction of a partial system of supplemental levees, bank protection works at 171 locations plus channel clearing and snagging, fish facilities, recreational facilities, channel modification works on 17 Willamette River subbasins, and "provision for release of waters from project reservoirs for domestic water supply and the irrigation of 452,000

acres of agricultural lands." In addition separate plans were being prepared for the Yamhill River and Tualatin River subbasins.

The major focus of the Willamette Project at pages 244-254 was on dams, levees, bank protection works, and channel improvements for flood control and ancillary power generation. Irrigation, fish hatcheries, and recreation were also described as very important parts of the Willamette Project. Lesser purposes in terms of impacts were listed in paragraph 527, (Accomplishments), at page 246 to also include potable water supply and reduction in stream pollution. Domestic water supply benefits were based on there being ample storage in individual reservoirs made available at relatively low cost for domestic use, where a reasonable charge could be made for stored water used by municipalities for domestic purposes. Navigation was also listed as a purpose and beneficiary of the Willamette Project at paragraph 530, page 247.

The authorized purposes of the Willamette Project were summarized in paragraph 545 (Conclusions), at page 252 as follows:

> "Upon completion of the plan of improvement, a major part of the present annual flood damages will be eliminated. Adequate facilities will be provided for navigation, and supplies of water will be made available for irrigating large areas, domestic use, power production, fish life, pollution abatement, recreation, and other uses."

The "Summary of Plan of Improvement" in paragraph 551, at page 254 repeated the same list of purposes:

"The primary accomplishments of the plan of improvement will be the control of floods and solution of major drainage problems. After the flood season, stored water will be released in a manner best suited to provide increased depths for navigation, for generation of hydroelectric power, and for the several conservative uses, namely: irrigation, potable water supply, and reduction of stream pollution in the interests of fish conservation, public recreation, and public health."

Paragraph 537 further provided that

> "In order to obtain the benefits listed above, the various units of the plan will be operated in a coordinated manner in the combined interest of flood control,

navigation, irrigation, power, drainage, fish and wildlife, recreation, domestic water supply, and stream pollution abatement."

A number of bank protection works were constructed downstream of the dams on the Willamette mainstem and tributaries as critical components of the authorized Willamette River Basin Flood Control Plan. Several fish hatcheries were authorized and constructed as mitigation for impacts to fisheries caused by dam construction. In addition to the dams and associated structural improvements, the USACE and other federal agencies are responsible for managing the land and water resources on federal lands surrounding the Willamette Project reservoirs for authorized purposes, particularly stewardship of fish and wildlife habitat and public recreation.

1.1.1.2 Volume 5, General Background Data

Existing USACE and federal projects were discussed on pages 1700-1703, including the 1938 project. On page 1701, it is significant that bank protection was "authorized as part of the coordinated [flood control] plan" in the 1938 project authorization. The 1936 Flood Control Act (page 1703) also "authorized bank protection work on the Willamette River and certain tributaries" for flood control purpose. The included tributaries were the Clackamas, Tualatin, Molalla, Santiam, Marys, and McKenzie rivers and Muddy Creek under the 1936 Flood Control Act. Plates 62 and 63 document about 70 bank protection sites authorized for flood control under the 1936 Flood Control Act. These sites were in addition to the 1938 and HD 531 sites.

Other background data of significance included surface water supply (pages 1706-1708), ground water supply (page 1708), water rights (pages 1708-1709), and flood data (pages 1708 - 1712).

The discussion of authorized purposes continued on page 1714, including navigation (pages 1714-1715), flood control (pages 1715-1723), bank protection, channel clearing and snagging as part of flood control (pages 1723-1725), hydropower (pages 1725-1726) drainage as part of flood control (pages 1726-1728), irrigation (pages 1728-1730), water supply in connection with irrigation (page 1729), recreation (pages 1730-1731), pollution abatement (pages 1731-1732), fish and wildlife (pages 1732-1734), public use of water (pages 1734-1735), domestic water supply (pages 1735-1736).

Various individual dam sites and impacts and auxiliary features were discussed on pages 1747-1790 and supplemental levees are discussed on page 1793.

1.2 OPERATIONAL FLEXIBILITY, COORDINATION, AND DISCRETIONARY MANAGEMENT

Authorization of the multiple purposes described above for the Willamette Project provides the USACE with operational flexibility, which it has used to address related multiple needs within the Willamette River basin. However, the USACE cannot use its discretionary management authority unilaterally. Annual meetings within the basin have been used by the USACE to provide a coordination process through which needs within the basin can be balanced. In these annual meetings, the USACE presents its draft plan for reservoir operations during the upcoming year to state and federal agencies, local groups, and the public. The plan is based on an analysis of anticipated precipitation and runoff patterns and is oriented towards scheduling the conservation release season. The objective is to develop a collaborative plan for the release of stored water, which accommodates a broad range of beneficial uses. This process has been used to build consensus and to formulate decisions regarding annual operating plans for the Willamette Project system. Over time, historical operational norms have been established.

If a substantial change from historical operational norms is contemplated, the USACE must comply with National Environmental Policy Act (NEPA) requirements, which include assessment of potential impacts and holding of public meetings. Operational changes significantly impacting authorized project purposes may also require congressional reauthorization for the Project.

1.3 FEDERAL ENDANGERED SPECIES ACT LISTED SPECIES

The Willamette Project influences, or has the potential to influence, a number of species that are listed, or are under consideration for listing, under the federal ESA. Listing involves identification of a species, subspecies, or a distinct population segment of a vertebrate species as either "Threatened" or "Endangered." The latter assignation applies to a species that is considered to be in danger of extinction throughout all or a significant portion of its range; the former applies when the species is considered likely to become endangered within the foreseeable future. A population subgroup within a Distinct Population Segment (DPS) is called an "Evolutionarily Significant Unit" (ESU) when the subgroup is considered to be substantially isolated reproductively from other DPS subgroups and it contributes substantially to the ecological or genetic diversity of the species.

There are presently five species relevant to the Willamette Project area for which DPSs are listed as Endangered, ten species and five ESUs that are listed as Threatened, and four species/ESUs that could become listed as Threatened, under the ESA (Tables 1-1 and 1-2).

There are other ESUs of a number of anadromous fish species that pass the mouth of the Willamette River as they migrate upstream and downstream through the Columbia River and that are listed or proposed for listing. Those ESUs are not likely to be influenced by the Willamette Project because they do not utilize the Willamette River, and relevant effects are not expected to occur to a significant degree in the Columbia River. This is based on the fact that individual facilities of the Willamette Project are removed in distance from critical habitat of other listed or candidate ESUs. The difference in size between the Columbia and Willamette rivers substantially limits the influence of water quality and quantity effects originating from the latter and occurring in the former. Moreover, members of the respective ESUs reside in the vicinity of the mouth of the Willamette for only a short period of time as they migrate upstream or downstream and should be capable of avoiding water originating from the Willamette as necessary.

1.4 THIS BIOLOGICAL ASSESSMENT AND THE CONSULTATION PROCESS

Section 7 of the ESA requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) if they determine that any action they fund, authorize, or carry out may affect a listed species managed by either agency or its designated critical habitat. A "Biological Assessment" (BA) is required of the agency when the action involves major construction projects, and is recommended for all other federal actions. The action assessed in this BA is the operation and maintenance of the existing Willamette Project as described here and in Chapter 2. The BA presents an evaluation of available information and a determination whether the action is likely to have an effect on a listed species or its critical habitat. The BA is provided to the appropriate resource agency (NMFS, USFWS) responsible for ensuring conservation of the species. Depending on the extent of the action and the nature of the effects, the resource agency reviews the BA and available information and determines whether a formal consultation under Section 7 is necessary. If formal consultation is deemed necessary, a formal Biological Opinion (BO) is then prepared by the resource agency. Informal consultation involves a “finding” by the action agency that the project or activity is not likely to adversely affect and a letter of concurrence from the resource agency.

Table 1-1. Listed, proposed, and candidate populations (Federal Endangered Species Act) of fish species in the Willamette River basin, Oregon.

Listed Populations	**Federal Register Citation**
Chinook Salmon (*Oncorhynchus tshawytscha*)	
Lower Columbia ESU (T[1])	64 FR 14308; March 24, 1999 [2]
Upper Willamette River ESU (T)	64 FR 14308; March 24, 1999 [2]
Chum Salmon (*O. keta*)	
Columbia River ESU (T)	64 FR 14508; March 25, 1999 [2]
Steelhead (*O. mykiss*)	
Lower Columbia River ESU (T)	63 FR 13347; March 19, 1998 [2]
Upper Willamette River ESU (T)	64 FR 14517; March 25, 1999 [2]
Bull Trout (*Salvelinus confluentus*) (T)	
Columbia River Distinct Population Segment	63 FR 31674; June 10, 1998
Oregon Chub (*Oregonichthys crameri*) (E)	58 FR 53804; October 18, 1993
Proposed Populations	
Coastal Cutthroat Trout (*O. clarki clarki*)	
Southwestern Washington/Columbia River ESU (T)	64 FR 16397; April 5, 1999 (NMFS) 64 FR 57534; October 25, 1999 (USFWS) [3]
Candidates for Listing	
Coho Salmon (*O. kisutch*)	
Lower Columbia River/Southwest Washington ESU	60 FR 38011; July 25, 1995
Possible Candidate for Listing	
Upper Willamette Cutthroat Trout (*O. clarki clarki*)	*considered by USFWS* [3, 4]

[1] T = Threatened
E = Endangered
Note: none of the salmon or steelhead ESUs in the Willamette River basin are proposed or listed as endangered.
[2] Critical habitat was recently designated on February 16, 2000 (65 FR 7764).
[3] USFWS now has jurisdiction over coastal cutthroat trout range-wide.
[4] Determined "Not Warranted" by NMFS.

Table 1-2. Listed and proposed wildlife and plant species (Federal Endangered Species Act) in the Willamette River basin, Oregon.

Listed Species	**Federal Register Citation**
Gray wolf *(Canis lupus)* (T)	32 FR 4001; March 11, 1967
Columbian white-tailed deer, *(Odocoileus virginianus leucurus)* (E)	32 FR 4001; March 11, 1967
Marbled murrelet *(Brachyramphus marmoratus)* (T)	57 FR 45328; October 1, 1992
Aleutian Canada goose *(Branta canadensis leucopareia)* (T)	32 FR 4001; March 11, 1967
Bald eagle *(Haliaeetus leucocephalus)* (T)	32 FR 4001; March 11, 1967
Northern spotted owl *(Strix occidentalis caurina)* (T)	55 FR 26114; June 26, 1990
Golden paintbrush *(Castilleja levisecta)* (T)	62 FR 31740; June 11, 1997
Howellia *(Howellia aquatilis)* (T)	59 FR 35864; July 14, 1994
Bradshaw's lomatium *(Lomatium bradshawii)* (E)	53 FR 38451; September 30, 1988
Nelson's checker-mallow *(Sidalcea nelsoniana)* (T)	58 FR 8242; February 12, 1993
Willamette daisy *(Erigeron decumbens* var. *decumbens)* (E)	65 FR 3875; January 25, 2000
Kincaid's lupine *(Lupinus sulphureus* var. *kincaidii)* (T)	65 FR 3875; January 25, 2000
Fender's blue butterfly *(Icaricia icarioides fenderi)* (E)	65 FR 3875; January 25, 2000
Proposed Species	
Canada lynx *(Lynx canadensis)* (T)	63 FR 36994; July 8, 1998

T = Threatened
E = Endangered

Wildlife and plant species of concern and candidates for listing are not included in this BA. However, several are known to occur on USACE project lands in the Willamette Basin. Consequently, Appendix A is included to provide biological information, baseline conditions, and analyses of effects for species known to occur on USACE project lands. Should these species be proposed or listed in the future, the USACE will reinitiate consultation as appropriate.

1.4.1 Action Agencies

For purposes of the consultation, the USACE is the designated lead agency because it oversees operation of the Project; other agencies that are directly involved in this consultation through Memoranda of Agreements (MOAs) include the Bureau of Reclamation (BOR) and U.S. Department of Energy, Bonneville Power Administration (BPA). Responsibilities and activities

undertaken by the USACE are described in detail in Chapter 2. The involvement of the other two action agencies is summarized below.

1.4.1.1 Bureau of Reclamation

The BOR markets water stored by the Willamette Project that is deemed by the USACE to be available for irrigation uses, per the authority given the Secretary of the Interior by Section 8 of the Flood Control Act of 1944. A series of correspondences during 1952 and 1953 constitute the agreement between the BOR and the USACE for the sale of water from USACE Willamette River basin reservoirs for irrigation purposes. The BOR has filed permits with the Oregon Water Resources Department (OWRD) to store irrigation water in the storage space allocated to irrigation. Contracting activities began in 1953 to market irrigation water from the three reservoirs existing at that time. Interest in use of stored water for irrigation has increased substantially in recent years. Sixty-one percent (153) of contracts have been entered into since 1990, out of 250 currently in effect. The BOR is currently accepting but not processing applications for irrigation water service contracts until this BA and the resultant BO are completed, with the exception of ten applicants who requested contracts prior to this consultation process, entered into temporary contracts for 1999, and can enter into temporary contracts for the 2000 irrigation season if water is determined to be available for this year. Only when this BA and the resultant BO are completed will new requests be processed, and water will be allocated in the order of requests received according to the outcome of the consultation process regarding the amount of water that can be made available to new contracts. Contracting activities must comply with OWRD, Oregon Department of Fish and Wildlife (ODFW), NEPA, and ESA requirements that are designed to protect environmental resources.

1.4.1.2 Bonneville Power Administration

The BPA markets and distributes power generated at federal dams on the Columbia River and its tributaries. The agency sells power from the dams and other generating plants to public and private utilities and large industries, and it builds and operates transmission lines that deliver the electricity. Federal law requires that the BPA, when providing electricity produced at the federal dams, give preference to publicly owned utilities and to entities in the Pacific Northwest. The USACE owns and operates thirteen projects in the Willamette River basin of which eight produce power for BPA. BPA pays for approximately 37 percent of the capital, operations, and maintenance costs of those eight power projects. Five projects have less than 30 MWs capacity. All eight projects have a combined nameplate capacity of 408 MWs.

There are two types of hydropower projects, storage, and reregulation. Lookout Point, Detroit and Green Peter are storage projects and are associated with reregulation dams located downstream (Dexter, Big Cliff, and Foster, respectively). The Foster project also acts as a storage facility. The Hills Creek and Cougar storage projects do not have reregulation dams. Power facilities do not exist presently at the Fall Creek, Blue River, Dorena, Cottage Grove, or Fern Ridge projects.

The USACE has a major role in coordinating multiple uses of the Willamette Project. The USACE develops operating plans for their projects according to authorized uses and in conjunction with the needs of multiple users. These plans define the normal range within which a reservoir or dam is operated. Within these operating limits, BPA schedules hydropower production and dispatches the power produced. This process requires continuous communication and coordination through the Reservoir Control Center (RCC) and among the agencies.

The protection, mitigation, and enhancement of fish and wildlife resources of the Columbia River and its tributaries is one of the goals of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act). That Act requires that the Northwest Power Planning Council develop both a program to protect and rebuild Columbia River basin fish and wildlife resources (the Columbia River Basin Fish and Wildlife Program; NPPC 1994) and a 20-year plan for meeting the region's electrical energy needs (the Northwest Conservation and Electric Power Plan). The Act also requires that BPA fund protection, mitigation and enhancement activities consistent with the NPPC's Fish and Wildlife Program, the Power Plan and other purposes of the Northwest Power Act. The Willamette River basin projects are included. Willamette projects located above Willamette Falls that have been funded by BPA are listed in Table 1-3.

Transmission line maintenance by the BPA has been addressed in current and past ESA Section 7 consultations with the USFWS and NMFS. The BPA is currently consulting with the USFWS and NMFS on all listed fish and snail species that may be affected by its facility maintenance program (including transmission lines). One meeting has been held with the USFWS (Alison Beck-Haas of the Boise Field Office) and several meetings with the NMFS (Cathy Tortorici of the Portland Office) to discuss approaches for defining the baseline and assessing the effects over the entire BPA service territory. A biological assessment is planned to be submitted to the NMFS and USFWS on the program in late spring of 2000.

Table 1-3. Fisheries enhancement and mitigation projects funded by BPA in the Willamette River basin above Willamette Falls. These projects were funded under the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program (NPPC 1994) (from P. Smith, BPA).

Project	Description	Stream	Beginning	Ending	Status
Willamette Hatchery Oxygen Supplementation	Determines survival of chinook salmon reared at various densities under conditions of oxygen supplementation	Willamette River	1990	2000	No Renewal
Bull Trout Assessment	Monitor distribution, population trends and habitat use	Willamette/ McKenzie rivers	1998	2002	Ongoing
Willamette Basin Mitigation Program	Mitigation for hydroelectric facilities through enhancement, easement development, acquisition, restoration and management of wetlands and other target habitat types and their respective species	Willamette River	1996	2003	Ongoing
McKenzie River Focus Watershed Coordination	Administration of McKenzie Focus Watershed for coordinated planning, assessment, monitoring and fish and wildlife enhancement projects	McKenzie River	1997	2000	Ongoing; Renewal Expected
Assess McKenzie Watershed Habitat and Prioritize Projects	Basin-wide habitat assessment	McKenzie River	2000	2001	Ongoing
Amazon/Willow Creek	Habitat Enhancement, O&M	Willow Creek	1992	2000	Ongoing; Renewal Expected

The BPA has previously consulted with the USFWS on transmission line maintenance effects on Northern spotted owl and received a concurrence of no effect for all activities except danger tree cutting from USFWS (letter dated June 4, 1992 to Cliff Perigo, BPA, signed by David C. Frederick, USFWS Field Supervisor, Olympia Field Office, and Russell D. Peterson, USFWS Field Supervisor, Portland Field Office; USFWS Reference 1-3-92-I-524 and 1-7-92-I-421). Danger tree cutting is addressed with a protocol to determine whether the trees are potential nest trees. If not, a no effect determination is documented by the BPA. If they are, the USFWS is consulted. In addition, the USFWS recommended in the letter referenced above that, "where the opportunity exists, activities within 0.25 miles of known spotted owl core areas be suspended

between March 1 and June 30, unless the spotted owls are shown to be non-nesting." The BPA maintains an annually updated Geographic Information System (GIS) database with spotted owl core areas to assist maintenance crews in following this recommendation.

The BPA has also consulted with the USFWS on maintenance effects on the marbled murrelet. On April 27, 1995, the USFWS issued a BO concluding that the maintenance program is not likely to jeopardize the continued existence of the species (letter to Robert W. Beraud signed by Russell D. Peterson, USFWS State Supervisor; 1-7-95-F-200. The BO contained an incidental take statement allowing for take of marbled murrelets caused by BPA's maintenance activities and imposed the following terms and conditions:

1) During the core breeding season (April 1 - August 5), BPA will not conduct maintenance activities within 0.4 km (0.25 miles) of known marbled murrelet habitat or occupancy (based on survey results).

2) During the late breeding season (August 6-September 15), BPA will not conduct maintenance activities which utilize motorized equipment (except regular pickup trucks) within 0.4 km (0.25 miles) of marbled murrelet habitat or occupancy except during the periods commencing two hours after sunrise and ending two hours before sunset.

The BPA maintains an annually updated GIS database with marbled murrelet habitat to assist maintenance crews in complying with this term and condition.

The BPA consults with the USFWS on other species on a case-by-case basis when it appears that maintenance activities may affect listed species. Training is provided to transmission line maintenance crews on what species are found in their areas and how to avoid effects.

1.4.1.3 Other Agencies Indirectly Involved with this Consultation

The USACE works cooperatively with many other federal agencies, which are not participating action agencies for purposes of this consultation, and with many state agencies within the Willamette River basin. Virtually every USACE project within the Willamette River basin is adjacent to or otherwise associated with the natural resources management projects of other federal agencies. Much of the Willamette Project occurs within the boundaries of the Willamette National Forest (WNF). The U.S.D.A. Forest Service (USFS) manages land and water resources within these boundaries. The Bureau of Land Management (BLM) manages public domain lands located adjacent to or near Fern Ridge, Fall Creek, Dorena, and Cottage Grove lakes.

Activities managed on National Forest System lands include timber harvest, road construction, road maintenance and closures, recreation, stream restoration, non-USACE power production, mineral activities, and other activities managed primarily through special use permits. The WNF began informal consultation on the effects of management on bull trout in July 1997 and formal consultation in July of 1998. Consultation with the USFWS and NMFS is completed for listed fishes for WNF annual programmatic actions. Consultation on the Long Range Management Plan (LRMP) with USFWS and NMFS is not completed for the WNF, but is in process. Memoranda of Agreements have been established between the Secretaries of the Army and Agriculture relative to management of water development projects entirely or partially within the National Forest System. The effects of USFS actions are generally related indirectly to the USACE action, and involve primarily the influence of resource management activities on stream habitat upstream of the reservoirs, and on management of reservoir related recreation.

Aside from the USACE requirement to coordinate its operations regarding the Willamette Project with the BOR, the BPA, and the USFS, the USACE is required by law to coordinate operation of its flood control projects and related actions in the Willamette River basin with NMFS, USFWS, the Natural Resources Conservation Service (NRCS), the Environmental Protection Agency (EPA), the U.S. Coast Guard, the U.S. Geological Survey (USGS), the U.S. Weather Service, the Bureau of Indian Affairs, the National Park Service, and related State of Oregon agencies. Among these many agencies, the BOR and BPA have specific missions and authorities that are directly impacted by operations of the Project.

1.4.2 History of This Consultation

The scale and scope of the Willamette Project is such that formal consultation with both NMFS and the USFWS is required. This document is the BA of the Willamette Project per requirements of the federal ESA. The BA evaluates the likely effects of the project on species that are either listed, proposed for listing, or are candidates under consideration for listing under the ESA. An effect determination is made accordingly for each species or ESU. All listed and potentially listed species are considered in this single document because much of the relevant information and effects are common to many or all species. An efficiency is therefore achieved that benefits the consultation process overall for the project. Copies of this BA are being provided to both NMFS and the USFWS because both consulting agencies are responsible for species potentially influenced by the Willamette Project. A brief description of steps taken during the consultation to date is summarized below.

On January 20, 1999 biologists from NMFS and USFWS met to discuss common issues of concern to be addressed in the ESA Section 7 consultation with the USACE. A letter from Russell D. Peterson, State Supervisor in Oregon for the USFWS, to Howard B. Jones, Chief of the Engineering and Construction Division, Portland District, U.S. Army Corps of Engineers (CENWP-EC), dated February 9, 1999 outlined the issues that these agencies agreed should be covered in a single BA for consultations with both agencies.

The NMFS provided additional information concerning the types of information to be included in the BA in their letter from Steven L. Morris, Ph.D., Chief, Oregon State Branch for Habitat Conservation, to Howard B. Jones, Chief CENWP-EC, dated February 25, 1999.

The USACE met on March 16, 1999 with representatives of both NMFS and USFWS to begin informal discussions relative to a multi-species ESA consultation regarding operation of the 13 Federal flood control projects located in the Willamette River basin (i.e., the Willamette Project). On March 26, 1999, the USACE sent letters to Russell D. Peterson, State Supervisor in Oregon for the USFWS, and to Steven L. Morris, Chief, Oregon State Branch for Habitat Conservation, NMFS, asking for a current listing of ESA species that might be affected by operation of the Willamette Project. The USACE also expressed its intention to continue working cooperatively with the resource management agencies in the Willamette River basin regarding coordination of ongoing Willamette Project operations during the interim period prior to completion of consultations.

The NMFS provided information to the USACE regarding ESA species under their purview occurring in the Willamette and lower Columbia rivers along with related status information by letter from Steven L. Morris, Chief, Oregon State Branch for Habitat Conservation, to Howard B. Jones, Chief CENWP-EC, dated March 30, 1999. Likewise, the USFWS provided information to the USACE regarding ESA species under their purview occurring in the Willamette River basin along with related status information by letter from Russell D. Peterson, State Supervisor in Oregon, to Howard B. Jones, Chief CENWP-EC, dated April 26, 1999.

On April 13, 1999, William Stelle, Jr., Northwest Regional Supervisor, NMFS, sent a letter to Howard B. Jones, Chief CENWP-EC, recommending minimum average weekly flows in the Willamette River during April through June 1999 for the protection of juvenile Upper Willamette River steelhead. The letter from NMFS to the USACE was in response to recommendations that they had received from ODFW. A meeting with NMFS and ODFW was held on April 5, 1999 to review the analysis of flow conditions as they relate to steelhead

survival upon which ODFW based their recommendations to NMFS. The USACE provided to NMFS and ODFW a flow forecast for the Willamette River basin indicating that the requested flows were likely to occur during April through June in 1999, and agreed to coordinate closely with resource managers in the basin regarding reservoir storage and flow conditions during this time period. Subsequent flow conditions in the Willamette River basin during April through June 1999 exceeded the minimum flows requested.

A meeting between the BOR and the USACE was held on May 3, 1999 in which a decision was made that BOR would participate, with the USACE as lead Action Agency, in the development of this BA as a means of satisfying their ESA consultation requirements with respect to management of agreements for use of water stored in the USACE Willamette Project reservoirs.

A initial review of materials drafted for the Willamette Project BA was hosted by the USACE on September 15, 1999 to obtain comments and guidance from NMFS and USFWS regarding BA development. A subsequent review was held on January 12, 2000. Comments from NMFS and from USFWS, along with comments resulting from internal review by the USACE staff, were obtained and incorporated into subsequent BA drafts.

1.4.2.1 Hatchery Consultation

A meeting was held at the USACE Portland District office on April 12, 1999 with ODFW to discuss mutual concerns regarding ESA consultation requirements as they pertain to funding and operation of mitigation hatchery programs in the Willamette River basin. As a result of that meeting, the USACE agreed to provide assistance to ODFW in collecting and analyzing data relevant to evaluation of genetic risks of these programs and relevant to the development of appropriate hatchery program operational protocols.

A meeting with NMFS and ODFW was held on December 21, 1999 to discuss progress regarding hatchery program data collection and subsequent needs for analysis and reporting. NMFS identified both interim reporting requirements relevant to operations during the year 2000 and subsequent reporting needed to satisfy both ESA 4(d) rule requirements applicable to the State of Oregon and related Section 7 consultation requirements of the USACE. ODFW was prepared to meet near-term reporting requirements for operations during 2000, but the process, resources and timeframe needed for addressing longer-term reporting requirements was uncertain. As a result, a letter was drafted from Thomas E. Savidge, P.E., Chief of the Operations Division, Portland District, U.S. Army Corps of Engineers (CENWP-OP), dated

January 18, 2000, to Dr. Douglas DeHart, Chief of Fisheries, ODFW, requesting their participation in a cooperative planning effort with NMFS and the USACE to address ESA requirements related to the USACE Willamette River basin mitigation hatchery programs. The products of the planning and subsequent analysis effort will supplement this BA.

1.4.3 Definitions Concerning the Conclusions Made by this Biological Assessment

It is clear that the Willamette Project has had an effect on listed species to date and will continue to do so. Furthermore, because of the scale of the consultation, it is possible that other species affected by the Willamette Project may become listed during the present consultation process. This BA determines the nature and extent of the effect, and concludes for each listed species with one of the following two possible determinations:

1) The Project 'may affect, but is not likely to adversely affect" (NLAA) the listed species and critical habitat. This determination applies when effects are expected to be beneficial, discountable, or insignificant. Discountable effects are those that are extremely unlikely to occur, irrespective of the potential magnitude of the effect. Insignificant effects may have a high likelihood of occurring, but are of negligible magnitude because the proposed action does not have the potential to hinder attainment of relevant properly functioning indicators and has a negligible (extremely low) probability of taking proposed or listed salmon or resulting in the destruction or adverse modification of their habitat. An insignificant effect relates to the size of the impact and should never reach the scale where take occurs.

2) The Project "may affect, and is likely to adversely affect" (LAA) the listed species and critical habitat. This determination applies when adverse effects may occur as a direct or indirect result of the Project or its interrelated or interdependent actions. Some portion or aspect of the action has a greater than insignificant probability of having a detrimental effect upon individual organisms or habitat. Such detrimental effect may be direct or indirect, short- or long-term. The action is Alikely to adversely affect≅ if it has the potential to hinder attainment of relevant properly functioning indicators, or if there is more than a negligible probability of taking proposed or listed salmon or resulting in the destruction or adverse modification of their habitat. This determination would apply when the overall effect of an action has short-term adverse effects even if the overall long-term effect is beneficial. The determination is applicable to individual organisms at any point in their life history.

1.5 INTERRELATED AND INTERDEPENDENT USACE ACTIONS OCCURRING WITHIN THE WILLAMETTE RIVER BASIN THAT ARE A PART OF THIS CONSULTATION

The primary features of the Willamette Project and its operation are described in Chapter 2. There are also several other ongoing and proposed federal programs and studies that are related to the Willamette Project, and are considered to be a part of this consultation. These programs and studies are summarized below.

Willamette River Bank Protection Program: This program protects agricultural, suburban, and urban land in the Willamette Valley from erosion damage and is considered to be part of the operation of the Willamette Project for purposes of this consultation. The program was authorized by the Flood Control Acts of 1936, 1938, and 1950 to assist with addressing erosion problems in the region, and covers bank protection and channel clearing works along the mainstem Willamette River from New Era upstream to each of the USACE dams. As of September 1996, the program was 96 percent complete, with 489,795 linear feet of protection in place at 230 locations. Project components include riverbank revetments, pile and timber bulkheads, drift barriers, minor channel improvements, and maintenance of existing works for control of floods and prevention of bank erosion. Many of the bank protection sites along the mainstem Willamette River, and particularly in tributary areas, were specifically authorized as a part of the authorization for development of the system of flood control reservoirs to address effects of erosion downstream of the dams.

Willamette Water Temperature Control (WTC) Project: This long-term project has included investigation of the feasibility of modifying operations at Blue River Dam and at Cougar Dam in the McKenzie River basin to restore water temperature regimes below these projects to pre-project conditions. A Final Feasibility Report and Final Environmental Impact Statement were completed in April 1995. Plans call for structural modifications to the water intake systems at both facilities so that water can be drawn from different elevations within each reservoir, mixed, and discharged at the desired temperature. Construction is planned to occur at Cougar Dam first, and a separate Biological Opinion was issued on March 8, 2000 that evaluated short-term effects of construction activities on listed species in that area. This BA considers longer-term effects of specific Project operations intended to meet the goals of the WTC project.

Willamette River Basin Review (WRBR): This study, also known as the "Willamette Basin Reservoir Study" (WBRS) began in June 1996 and was sponsored by the OWRD. The study is investigating future water demand in the basin, particularly as it is related to operation of the

Willamette Project during the summer conservation storage and flow release season. The first year that changes to the operation of the USACE projects could be accomplished is estimated to be approximately 2003. During scoping for the study, it was agreed by the USACE and by the OWRD, that modifications investigated for system operational changes must not affect the flood protection aspects of the projects and the system as a whole. Also, the construction or modification of structural facilities at the Willamette projects is not being considered in the alternative scenarios to be developed for the feasibility study. The goals, objectives, time frames, and costs for this feasibility study focus on conservation season-related modifications in accordance with the actions contained in the Water Management Plan for the Willamette Basin, approved by the Water Resources Commission in January 1992. Completion and conclusions of the WRBR have been delayed pending completion of the present Willamette Project consultation process. This will allow operational requirements for protection and restoration of fisheries resources to be incorporated into alternative future operational options considered for the Willamette Project.

Willamette Floodplain Restoration Study (WFRS)*:* The purpose of this study is to evaluate opportunities to modify existing floodplain features that may help reduce flood damages by increasing natural flood management capability. The USACE reservoirs in the Willamette River basin control only 27 percent of the Willamette River basin drainage. A restored floodplain could help absorb excess flood waters, slow the velocity of the water, and create habitat for a variety of plants and animals, including listed fish and wildlife species. The study includes examining the feasibility of restoring natural wetlands and promoting ecosystem functional restoration. The reconnaissance phase of the study was completed in 1999. The study and any future activities related to it are considered to be a part of this consultation. While specific floodplain restoration actions cannot be identified prior to completion of the remaining study phases, the intent of the study and action options evaluated will be to aid in restoring floodplain ecosystem function consistent with reasonable and prudent action alternatives identified as a part of this consultation.

Santiam River Fish Passage Restoration Project: The USACE has proposed constructing a prototype model surface collection system near the points of entry of Quartzville Creek and the Middle Santiam River in Green Peter Reservoir, from which steelhead and salmon could be transported around the reservoir and dam.

A reconnaissance report investigating restoring native winter steelhead and spring chinook salmon runs in the South Santiam River was completed by the USACE in July 1995. It found

that the fish passage facilities originally constructed at the Green Peter project do not provide effective juvenile and adult fish passage that will allow anadromous fish to access their natural spawning and rearing habitat upstream from the project. The report determined that a collection system at the head of the reservoir is needed so that steelhead and salmon can be trucked or piped around the reservoir and dam in order to avoid reservoir related mortality (e.g., predation). It recommended the use of floating juvenile fish collectors in the upper arms of the reservoir (at confluences with Quartzville Creek and with the Middle Santiam River) and correcting the water temperature in the adult fish ladder as the most cost-effective means.

The Office of the Assistant Secretary of the Army for Civil Works concurred that the project's existing fish passage facilities have not functioned as intended and that modifications are needed to meet the project's authorized mitigation requirements. Remedial actions are to be pursued under the USACE Operation and Maintenance (O&M) authority as a major rehabilitation project. Timely accomplishment of this project following the suggested approach and within current budget limitations is not likely to occur.

If remedial action was authorized and funding was available, the USACE would design and install a prototype surface collection system and initiate collection and transport around the reservoir and dam of juvenile steelhead and salmon. The effectiveness of the system will be monitored, evaluated, and modified (if necessary). If this prototype does prove successful, the feasibility of installation at other Willamette Project dams and reservoirs would be evaluated as a means of addressing the USACE's mitigation requirements.

Middle Fork Willamette River Fishery Restoration Project: A reconnaissance level study was initiated in 1995 and completed in 1997 that evaluated the potential to modify existing USACE dam and fish passage structures to restore native runs of spring chinook salmon and winter steelhead trout upstream of the Hills Creek and Lookout Point/Dexter projects (USACE 1997). The study evaluated alternatives for adult and juvenile passage and identified four alternatives for re-establishing runs above Lookout Point Reservoir. The alternatives were combinations of measures providing both juvenile and adult passage past the Lookout Point/Dexter projects. Two of the alternatives also provided temperature control of water releases from Hills Creek Dam to facilitate upstream migration. While federal interest in further study was demonstrated, a feasibility level study will not proceed until local sponsor funding becomes available. The effects of restoring the fishery are addressed in this BA because appropriate measures directly involve Willamette Project facilities.

1.6 OTHER USACE ACTIONS OCCURRING WITHIN THE WILLAMETTE RIVER BASIN THAT ARE NOT A PART OF THIS CONSULTATION

1.6.1 General Investigations and Continuing Authorities Programs

The process through which USACE plans, designs, and obtains congressional authorization and funding for construction of new projects and updating existing ones is called the Planning Program. Portland District has several ongoing planning studies that are either directly or indirectly related to recovery of threatened Willamette Basin fish stocks. These studies fall under two categories: 1) the General Investigations (GI) Program and, 2) the Continuing Authorities Program (CAP).

The GI program generally addresses large, multiple purpose water resource projects that are specifically authorized by Congress. Projects under this authority can look at a broad and complex range of activities and have no cap on funding level. GI Studies are conducted in two phases. The first phase, called the reconnaissance phase, is a cursory overview funded at 100 percent federal cost. The reconnaissance phase is designed to identify water resource problems and opportunities in which there is a federal interest in conducting more detailed study during the following feasibility phase. Feasibility phase studies are cost-shared 50/50 with a local sponsoring entity or entities.

There are several ongoing GI studies in the Willamette Basin that are at various phases:

1) Willamette Basin Reservoir Feasibility study (also know as the Willamette Basin Review Study).
2) Willamette Basin Floodplain Restoration Reconnaissance Study.
3) Middle Fork Fish Restoration Feasibility Study
4) Lower Willamette River Environmental Dredging Reconnaissance Study

Each of these ongoing GI studies was described previously under Section 1.5, Interrelated and Interdependent Actions.

The CAP program generally includes smaller (maximum federal share of $5 million), single-purpose water resource projects for which Congress has delegated the authority to the USACE to construct without specific authorization. Two of these authorities specifically allow ecosystem

restoration projects, including restoration of habitat critical for recovery of threatened species in the Willamette. They are Section 1135 (Modification of Existing Corps Projects for Environmental Restoration) and Section 206 (Aquatic Ecosystem Restoration Projects). These authorities and the projects currently being planned and implemented through them illustrate the kinds of water resource problems and opportunities related to fish habitat recovery that the USACE is currently addressing throughout the Willamette Basin. Projects pursued under the Continuing Authorities Program require non-federal cost-share obligations of 25 to 50 percent of the total project cost.

ESA and environmental compliance with respect to individual projects under the WRDA program are normally handled on a case-by-case basis and are not a part of this consultation. However, certain ongoing projects in the Willamette River basin (e.g., WRBR and WFRS) are identified as "interdependent and interrelated" USACE actions under this consultation because they provide specific opportunities and mechanisms through which potential impacts of the Willamette Project can be better defined or addressed.

1.6.1.1 Section 1135 Environmental Restoration Projects

The Section 1135 program provides authorization and funding for small environmental restoration projects, either at the project site or off -project site when it is found that the USACE project contributed to the degradation of the environment. Section 1135 projects are cost-shared at 75 percent federal/25 percent local share. The USACE currently has four Section 1135 projects ongoing in the Willamette River basin that may contribute to the recovery of salmon to varying degrees:

> ***Lower Amazon Creek Wetlands***. Currently under construction in summer 1999, this project will restore 398 acres of wet prairie wetlands adjacent to Amazon Creek, a tributary of the Long Tom River. While not specifically designed as a fish restoration project, this project will restore natural floodplain function along Amazon Creek and is expected to have incidental water quality benefits. The City of Eugene is the local sponsor.
>
> ***Fern Ridge Marsh***. Currently under construction in summer 1999, this project will provide additional permanent marsh habitat for waterfowl and other species. While this project is also not designed for fish benefits, it illustrates the kinds of habitat restoration

projects that could be constructed for fish and other species under Section 1135. The ODFW is the local sponsor.

Mission Bottom. This project, currently in the feasibility phase of study, is evaluating the potential for restoring flows into Mission Lake, an oxbow lake along the mainstem Willamette River at Mission Bottom State Park. Flows in the lake were affected by construction of a bank protection project by the USACE at its downstream outlet. Modification of the flows through the lake could have benefits for juvenile salmonid rearing habitat and other purposes. If determined to be feasible, the project is scheduled to be constructed in the summer of 2000. Oregon State Parks Department is the local sponsor.

Richardson Park. This project, currently in the design phase, would restore a small stream entering Fern Ridge Lake at Richardson Park, operated by Lane County. The stream, culverted when the park was constructed, will be daylighted and stream habitat restored. The project is expected to support native cutthroat trout and other species. The project is scheduled for construction in the summer of 2000.

1.6.1.2 Section 206 Aquatic Ecosystem Restoration Projects

The Section 206 program authorizes and funds small aquatic ecosystem restoration projects to improve the quality of the environment. Unlike section 1135, for Section 206 authority, there is no requirement that projects be linked to an existing USACE project. Section 1135 projects are cost-shared at 65 percent federal/35 percent local share. The USACE currently has four Section 206 projects ongoing in the Willamette River basin that may contribute to the recovery of salmon to varying degrees:

Bowers Rocks. This project, currently in the feasibility phase of study, is evaluating the potential for restoring habitat and hydrology associated with a gravel pit and stream along the mainstem Willamette River at Bowers Rock State Park, near Albany. Modification of the streamflows to the gravel pit lake could have benefits for juvenile salmonid rearing habitat and other purposes. If determined to be feasible, the project is scheduled to be constructed in the summer of 2000. Oregon State Parks Department is the local sponsor.

Springfield Millrace. This project, currently in the feasibility phase of study, is evaluating opportunities to restore degraded habitat in the Springfield Millrace. The Millrace is an unscreened diversion channel. Restoration of the channel entrance and habitat areas within the channel, including the Springfield Millpond, may be beneficial for juvenile salmonids using the millrace. Local sponsor is the City of Springfield.

Eugene Delta Ponds. This project, currently in the feasibility phase, is evaluating opportunities for modifying hydrologic flow conditions through this series of old gravel pits and connecting them with the mainstem Willamette, with possible water quality and salmonid rearing benefits. The local sponsor is the City of Eugene.

Upper Amazon Creek. This is a new study authorized under the Water Resources Development Act of 1999. It will evaluate opportunities for restoring upper reaches of Amazon Creek, a tributary of the Long Tom River, as it flows through Eugene.

1.6.2 Miscellaneous Programs

Regulatory Permit Program: The USACE performs a variety of environmentally related permitting functions under the Clean Water Act, the Rivers and Harbors Act, and other authorities. ESA and environmental compliance are handled for individual project applications under the Regulatory Permit Program according to established protocol. This includes applications for related projects occurring within the Willamette River basin. Consequently, the Regulatory Permit Program and related projects in the Willamette Valley are not included in this consultation.

Willamette Harbor Deepening and Maintenance Dredging: The maintenance dredging program in the Willamette River below Willamette Falls, and the proposed channel deepening activities, are closely associated with similar programs on the lower mainstem Columbia River. These actions are independent of Willamette River basin flood control system operation and will be addressed under an independent ESA consultation process.

Willamette River Environmental Dredging Study: The purpose of this study is to evaluate opportunities to enhance and restore the ecosystem in the lower Willamette River by identifying and evaluating remedies for eliminating contaminated sediments. This study, which falls under the Environmental Dredging Authority authorized in the Water Resources Developments Acts of 1990, 1996 and 1999, is intended to coincide with the state investigation and cleanup of

contaminated sediments in the Portland Harbor and will augment other ecosystem restoration activities related to contaminated sediments. The reconnaissance phase of the study will be completed in 2000. The study and any future activities related to it are considered to be a separate action outside of the scope of this BA. ESA and environmental compliance will be addressed under a separate Section 7 consultation.

Operation and Maintenance of Willamette Falls Locks: Operation and maintenance of the system of locks at Willamette Falls are independent of Willamette River basin flood control system operation and will be addressed under an independent ESA consultation process.

1.7 ORGANIZATION OF THIS BIOLOGICAL ASSESSMENT

This BA was written with the goal of providing appropriate information that could be used by the consulting resource agencies (NMFS and USFWS) in writing formal Biological Opinions. The writing focuses on project features and operations that influence listed species directly and indirectly. Chapter 2 summarizes features of the Willamette Project and its thirteen individual member projects that have the potential to influence listed species. Chapter 3 summarizes the methods used in preparing this BA. Chapter 4 presents information on the life history cycles and needs, and population status of each species and ESU that is listed or is under consideration for listing under the federal ESA. Chapter 5 presents a description of the environmental baseline against which future effects of the Project are evaluated. Chapter 6 reviews available information and identifies likely effects of the Project on each listed species and ESU. Chapter 7 identifies cumulative effects of non-federal projects and activities unrelated to the Willamette Project that are reasonably certain to occur within the action area. Chapter 8 summarizes the findings of this BA. Appendix A provides biological information, baseline conditions, analyses of effect, and other pertinent information for the species of concern and candidate plants and wildlife known to occur in the Willamette Basin Projects. Appendix B presents summaries for each project of pertinent project information from current approved master plans or from historic planning documents. Appendix C presents general schematics of the thirteen USACE dams and reservoirs of the Willamette Project. Appendix D contains recent hatchery data pertinent to Willamette Project mitigation. Appendix E presents graphs of the reservoir rule curves and representative operations. Appendix F presents selected stream discharge data from gages located upstream and downstream of Willamette Project dams. Appendix G presents GIS plots of state of Oregon water-quality impaired stream reaches in the Willamette River basin.

The Willamette Project influences a large area and many species. This BA is organized by project and the major subbasins in which they are found. Each subbasin has unique physical,

biological, and project operational features that may differentially influence the nature and extent of potential effects on listed species and their habitat. Effects are consequently evaluated at the lower Columbia River basin scale in the area below the confluence with the Willamette River, at the mainstem Willamette River basin scale, at the subbasin scale for key tributaries to the Willamette River, and at the individual project level. The key Willamette River subbasins include: the North and South Forks of the Santiam River, the McKenzie River, the Middle Fork Willamette River, the Coast Fork Willamette River, and the Long Tom River.